Transactions of the Royal Society of S. Aust. (2004), **128**(1), 47-51.

SYPHACIA (SYPHACIA) AUSTRALASIENSIS SP. NOV. (NEMATODA: OXYURIDAE) FROM *RATTUS LEUCOPUS* (MURIDAE) FROM PAPUA NEW GUINEA AND AUSTRALIA

by L. R. SMALES*

Summary

SMALES, L.R. (200) *Syphacia (Syphacia) australasiensis* sp. nov. (Nematoda: Oxyuridae) from *Rattus leucopus* (Muridae) from Papua New Guinea and Australia. *Trans. R. Soc. S. Aust.* **128**(1), 47-51, 31 May, 2004.

Syphacia (Syphacia) australasiensis sp. nov. is described from the caecum of *Rattus leucopus* (Gray) (Rodentia: Muridae) from Papua New Guinea and Queensland, Australia. The new species is distinguished from congeners with an oval cephalic plateau by the lack of lateral alae, a longitudinal ridge along the egg and a combination of measurements including spicule length, tail length, distance to anterior mamelon and size of eggs. The origins of the genus and the relationships of the species in the Australian region are discussed.

KEY WORDS: Nematoda, Muridae, *Rattus*, *Syphacia*, new species.

Introduction

The pin worm genus *Syphacia* (Nematoda: Oxyuridae) is a cosmopolitan genus occurring in the rodent families Cricetidae and Muridae (Hugot 1988). All Australian rodents are contained within the family Muridae, either a few relatively recent arrivals, representative of the genus *Rattus* (Murinae), or, the majority of species (Hydromyinae), that arrived in Australia from Indonesia via New Guinea no more than 5-8 million years ago (Strahan 1995). The currently known pin worm species associated with the murids from Australia and the island of New Guinea are *Syphacia muris* Yamaguti, 1935, a cosmopolitan species; *Syphacia darwini* Quentin & Hugot, 1988 known only from Australian representatives of the hydromyine genus *Melomys* and *Syphacia longaecauda* Smales, 2001 known only from New Guinean representatives of the genus *Melomys*.

Rattus leucopus (Gray) the Cape York rat is one of only six species of murids that occur in both Australia and Papua New Guinea (Flannery 1995; Strahan 1995). Examination of material collected from both locations revealed a new species of *Syphacia* that is described in this paper.

Materials and Methods

Nematodes, previously dissected from *R. leucopus* and stored in 70% ethanol in the South Australian Museum (SAM) or the CSIRO Wildlife Collection, Canberra (CSIRO), were cleared in lactophenol for examination. Specimens identified as *Syphacia* sp. were measured using an ocular micrometer and drawn with the aid of a drawing tube attached to an Olympus BH microscope. Measurements for 10 individuals of each sex are presented in µm as the range followed by the mean in parentheses.

Syphacia (Syphacia) australasiensis
(FIGS 1-11)

Holotype
♂ from caecum of *Rattus leucopus* (Gray) Brown River, Papua New Guinea, 25.vi.1968 coll. W. Ewers, SAM AHC 32142.

Allotype
♀ same data SAM AHC 32143.

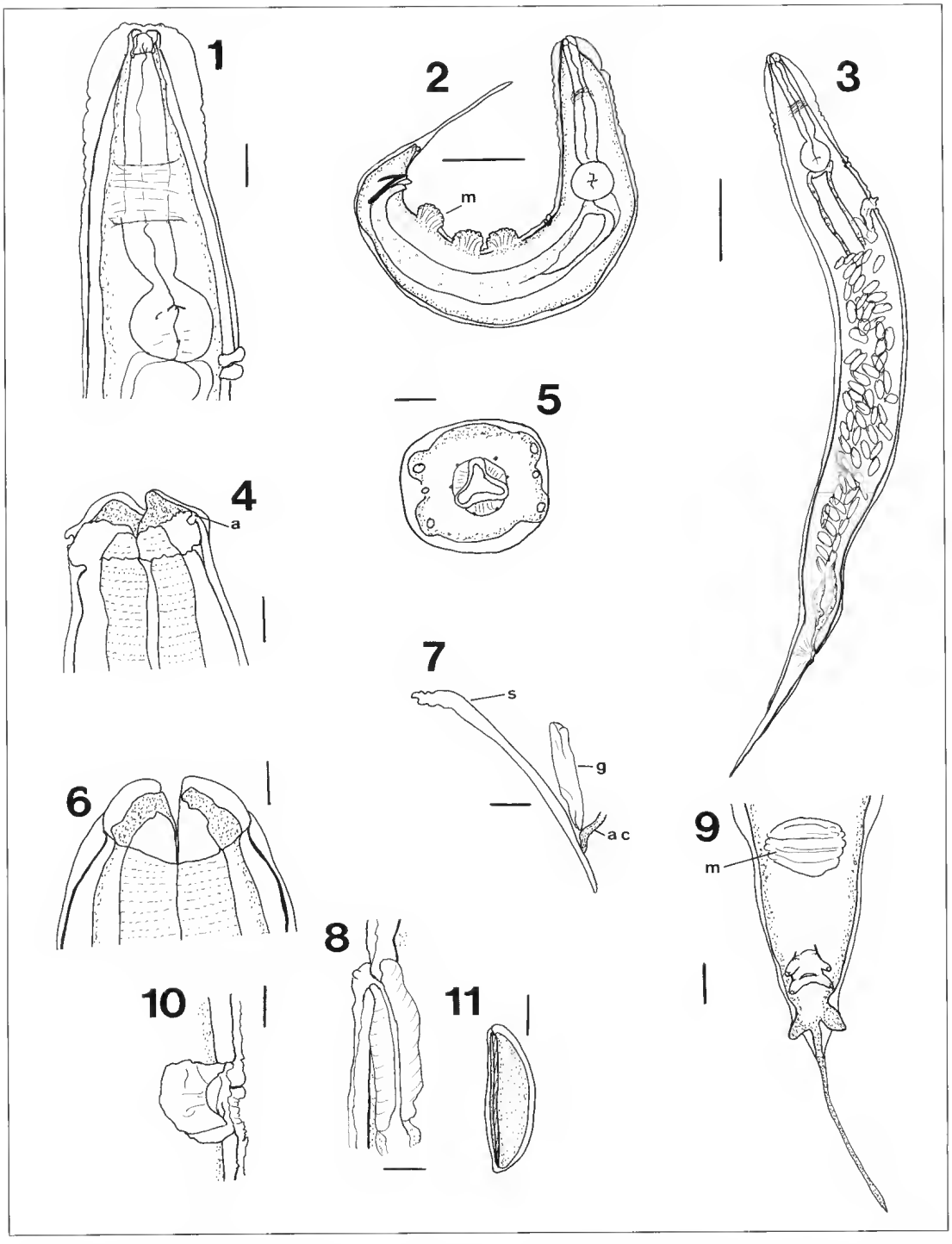
Paratypes
Same data SAM AHC 5141.

Other material examined
From caecum of *Rattus leucopus*, E. McIllwraith Ra., Cape York Peninsula, North Queensland, Australia 10.viii.1990, coll. P. Catling and P. Haycock, CSIRO N3325, 5 ♀♀, 3 ♂♂; Brown River, Papua New Guinea, 25.vi.1968, coll. W. Ewers, AM AHC 5201, 5152, 5149, 95 ♀♀, 1 ♂.

Site in host
Caecum and colon.

Description
Small nematodes, typical oxyurid shape, with transverse cuticular striations. Cephalic inflation distinct. Cephalic plateau oval, elongated laterally; distance between amphids 30, amphids situated between cephalic papillae; cephalic papillae on lateral projections; six labial papillae; mouth

* School of Biological and Environmental Sciences, Central Queensland University, Rockhampton Qld 4702, Australia. Email: l.warner@cqu.edu.au



Figs 1-11 *Syphacia (Syphacia) australasiensis* sp. nov. 1. Male, anterior end, dorso-ventral view. 2. Male, lateral view. 3. Female, lateral view. 4. Anterior end, optical section, dorso-ventral view. 5. *En face* view. 6. Anterior end, optical section, lateral view. 7. Spicule and gubernaculum, lateral view. 8. Vagina, lateral view. 9. Male, posterior end, ventral view. 10. Excretory pore, lateral view. 11. Egg. Scale bars 1, 8, 9, 10, 11 25μm; 2, 50μm; 3, 100μm; 4, 5, 6, 7, 10μm.

opening simple, three small distinct pseudolabia. Oesophagus with isthmus, terminating in spherical bulb. Excretory pore posterior to oesophageal bulb. Nerve ring surrounding anterior oesophagus. Deirids not seen. Alae absent.

Male

Total length 690 – 1250 (810), maximum width 80 – 102 (95). Oesophagus 142 – 208 (192) long, oesophageal bulb 46 – 55 (51) in diameter. Nerve ring 75 – 120 (94), excretory pore 228 – 462 (289) from anterior end. Three mamelons with prominent annulations, spines not observed; first mamelon 297 – 583 from anterior end, second mamelon close behind first, third mamelon close behind second; mamelons all 35 – 40 long. Tail 142 – 181 (155) long. Spicule needle shaped 61 – 68 (65) long; gubernaculum 29 – 36 (31) long, ventral barb not observed. Two pairs preanal, one pair large post anal caudal papillae.

Female

Total length 1900 – 2900 (2400), maximum width 160 – 268 (170). Oesophagus 187 – 355 (298) long, oesophageal bulb 73 – 82.5 (78) in diameter. Nerve ring 107 – 135 (122), excretory pore 315 – 570 (460). Vulva with prominent knob, 436 – 804 (655) from anterior end. Tail 335 – 436 (385) long. Eggs with longitudinal ridge, 82.5 – 95 (87.5) by 29.5 – 36.3 (33).

Etymology

The species is named to reflect that it is found in both Papua New Guinea and Queensland.

Discussion

The nematode species described above belongs to the genus *Syphacia* Seurat, 1916 because it possesses the suite of characters proposed by Hugot (1988, see also figs 23, 24 and 39) to distinguish the genus. It belongs within the subgenus *Syphacia* Seurat, 1916 because it has neither the rectangular cephalic plateau and well developed triangular shaped lateral alae of the subgenus *Crictoxyuris* Hugot, 1988 nor the short conical tail characteristic of the subgenus *Seuratoxyuris* Hugot, 1988. Rather, it has an oval cephalic plateau, lacks cervical alae and well developed deirids.

Syphacia (Syphacia) australasiensis n. sp. in *en face* view most clearly resembles a cluster of species from murid hosts (*Rattus* species) from the Australasian biogeographic region, namely *S. muris* Yamaguti, 1935, *S. darwini* Hugot & Quentin, 1985, *S. longaecanda* Smales, 2001 and *S. sulawesiensis* Hasegawa & Tarore, 1996. It differs from each of these species in the form of the vulva, having a longitudinal ridge in the egg and males lacking lateral alae. It further differs from *S. muris* in having an oval rather than square cephalic plateau; from *S. longaecanda* in having a smaller cephalic plateau, 30μm between the amphids rather than 45 — 50μm; from *S. darwini* in having three, not two, mamelons and from *S. sulawesiensis* in having the females lacking lateral alae. *Syphacia australasiensis* differs from *S. lophuromys* Quentin, 1966 and *S. megaloon* Quentin, 1966, also lacking lateral alae in the morphology of the egg and vulva and in *en face* aspect. *S. lophuromys* and *S. megaloon* have a cephalic plateau elongated laterally with papillae and pseudolabia characterised as Group VIII by Quentin (1971). *S. lophuromys* and *S. megaloon* are found only in African murids. Further, *S. australasiensis* differs from each of the above species in one or more measurements of oesophagus, tail, spicule gubernaculum or eggs (Table 1).

The oxyurids, subfamily Syphaciinae are generally considered to have coevolutionary relationships with their hosts (Hugot, 1988). The similarities between *S. australasiensis*, *S. darwini*, *S. longaecanda* and *S. sulawesiensis* are therefore not surprising. Each has an oval cephalic plateau with distinct pseudolabia, "lips", and mouth surrounded by 6 labial papillae; each occurs in an endemic murid host, *Rattus* species or *Melomys* species; each has evolved within the Australasian biogeographic region, Sulawesi being to the east of Wallace's line, the boundary between the Asian and Australasian faunal regions (Raven, 1935).

The relationship between these four species and *S. muris* also occurring in *Rattus* species hosts, but cosmopolitan in distribution, is not clear. *Syphacia muris* is found in *R. ratttus* (Linnaeus) and *R. norvegicus* (Berkenhout) (see Smales, 1997) both of which are recent arrivals in Australia. Given that Hugot & Quentin (1985) found that *S. muris* from endemic *Rattus* spp. in Australia, corresponded morphologically and morphometrically to the description from cosmopolitan *Rattus* spp., the suggestion of Hasegawa & Tarore (1996) that infections in Australian endemic murids have been acquired from the recent arrivals seems sound.

The endemic *Syphacia* species may therefore have been derived from syphaciine populations introduced into the region as their rodent hosts invaded the Island of New Guinea and then Australia (Flannery, 1995). Subsequently speciation took place in both regions. *Syphacia longaecanda* has been found only in *Melomys* spp. endemic to New Guinea while *S. darwini* is known only from *Melomys cervinipes* hosts endemic to Australia. This suggests that there has been no migration of *Melomys* between the two islands. Very few data are

TABLE 1. *Measurements of* Syphacia australasiensis *this study compared with those of* S. muris, S. darwini, S. longaecauda, S. megaloon, S. lophuromyos *and* S. sulawesiensis *as given by Quentin, 1966, 1971; Hugot & Quentin, 1985; Hasegawa & Tarore, 1996 and Smales, 2001. Measurements for* S. muris *are those given by Hugot & Quentin (1985) from Australian rodent hosts. Measurements as given by Hugot & Quentin for the distance from the anterior of the nerve ring and excretory pore as well as oesophagus length and width appear to have either listed ♂ in the ♀ column and vice versa or the measurements given for these elements for ♀* S. muris *may be in error (see for example Hasegawa and Tarore, 1996).*

	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
	S. darwini		*S. longaecauda*		*S. lophuromys*		*S. megaloon*		*S. muris*		*S. sulawasiensis*		*S. australasiensis*	
Body length	1865	3960	1600-2050	4000-4400	1330	2630	1360	2000	1140	1430	1650-1910	3870-5140	690-1250	1900-2900
Body width	105	220	100-160	310-360	115	370	250	250	75	90	134-163	288-333	80-102	160-268
From ant. end to nerve ring	110	120	111-148	119-127	100	130	80	100	70	35	139-173	115-154	75-120	107-135
excretory pore	400	750	375-436	470-632	300	330	220	280	290	225	600-935	550-760	228-462	315-570
vulva	-	930	-	765-986	-	550	-	480	-	360	-	662-781	-	436-804
1st mamelon	830	-	600-850	-	430	-	450	-	500	-	915-1310	-	297-583	-
Oes length	230	320	240-355	408-456	200	310	-	300	160	120	261-304	278-429	142-208	187-355
Oes bulb width	50	100	60-93	121-127	60	90	-	-	40	30	62-77	96-112	46-55	73-82
Tail	247	700	370-490	616-850	240	410	130	200	115	300	84-100	544-670	142-181	355-436
Eggs	-	90x35	-	94-100 x34-42	-	110x48	-	150x60	-	90x30	-	77-86x 24-29	-	82-95x 29-36
Spicule	80	-	76-97	-	75	-	61	-	48	-	78-89	-	61-68	-
Gubernaculum	40	-	39-47	-	30	-	31	-	28	-	31-36	-	29-36	-

available from rodent hosts from New Guinea localities however, so there may be populations of *S. darwini* present there yet to be discovered. *Rattus leucopus* occurs in both regions and in both cases harbours *S. australasiensis*. This suggests that *S. australasiensis* migrated with *R. leucopus* into Australia. More data from murids across the region is needed before relationships can be derived and firm conclusions drawn.

Acknowledgments

Sincere thanks to Jan Forrest from the South Australian Museum and Dr. David Spratt from CSIRO Sustainable Ecosystems for lending me the material.

References

FLANNERY, T. (1995) Mammals of New Guinea (Reed Books, Chatswood).

HASEGAWA, H. & TARORE, D. (1996) *Syphacia (Syphacia) sulawesiensis* n. sp. and *S. (S.) muris* (Yamaguti, 1935) (Nematoda: Oxyuridae) collected from *Rattus xanthurus* (Gral, 1867) (Rodentia: Muridae) in Northern Sulawesi, Indonesia. *Trop. Zool.* **9**, 165-173.

HUGOT, J.-P. (1988) Les nématodes Syphaciine parasites de rongeurs et de lagomorphes. *Mém. Mus. Nat. Hist. Nat. Sér A* **141**, 1-148.

_____ & QUENTIN, J.-C. (1985) Étude morphologique de six espèces nouvelles ou peu connnues appartenant au genre *Syphacia* (Oxyuridae: Nematoda), parasites de Rongeurs Cricétidés et Muridés. *Bull. Mus. Nat. Hist. Nat. Ser. 4* **7**, 383-400.

QUENTIN, J.-C. (1966) Oxyures de Muridae africans. *Ann.Parasit.* **41**, 443-452.

_____ (1971) Morphologie comparée des structures céphaliques et génitales des oxyures du genre *Syphacia*. *Ann. Parasit. Hum. Comp.* **46**, 15-60.

RAVEN, H. C. (1935). Wallace's Line and the distribution of Indo-Australian mammals. *Bull. Am. Mus. Nat. Hist.* **68**, Article 4.

SMALES, L. R. (1997) A review of the helminth parasites of Australian rodents. *Aust. J. Zool.* **45**, 505-521.

_____ (2001) *Syphacia longaecauda* n. sp. (Nematoda: Oxyuridae) Syphacinea from *Melomys* spp. (Muridae: Hydrominae) from Papua New Guinea and Irian Jaya, Indonesia. *Parasite* **8**, 39-43.

STRAHAN, R. (1995) The Mammals of Australia (Reed Books, Chatswood).